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(71) Applicant(s)
Kirkmoss Limited

(Incorporated in the United Kingdom)

Stanway, 12 Highgate Road, Altrincham, Cheshire, WA14 4QZ, United Kingdom

(72) Inventor(s)
Curtis Albert Sparkes

(74) Agent and/or Address for Service
Mewburn Ellis
York House, 23 Kingsway, LONDON, WC2B 6HP, United Kingdom

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GB 0749119 A

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(54) Folding pushchair brake mechanism

(57) A wheel brake mechanism for a pushchair which is foldable about axes X, Y, comprises primary brake means 8, 9 engageable with a first wheel 6; at least one subsidiary brake means 8, 9 engageable with a respective at least one oth r wheel 6; and coupling means 20, 50a, 50b which operatively couple the primary brake means to the or each subsidiary brake means. The coupling means are constructed and arranged such that the operative coupling is permanent and unaffected by the folded state of the chair. In one embodiment, two Bowden cables 50a, 50b, are interconnected by a rack and pinion device 20; whilst in another embodiment, the primary brake means is connected to a subsidiary brake means by two Bowden cables (61, 62, Fig. 5). The use of Bowden cables permits folding of the chair without affecting the braking operation of the mechanism.

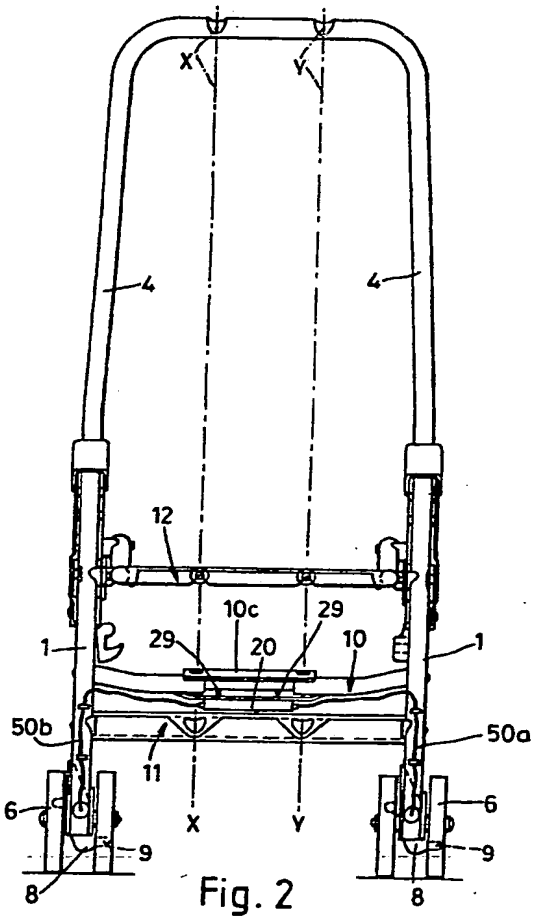

Fig. 2

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

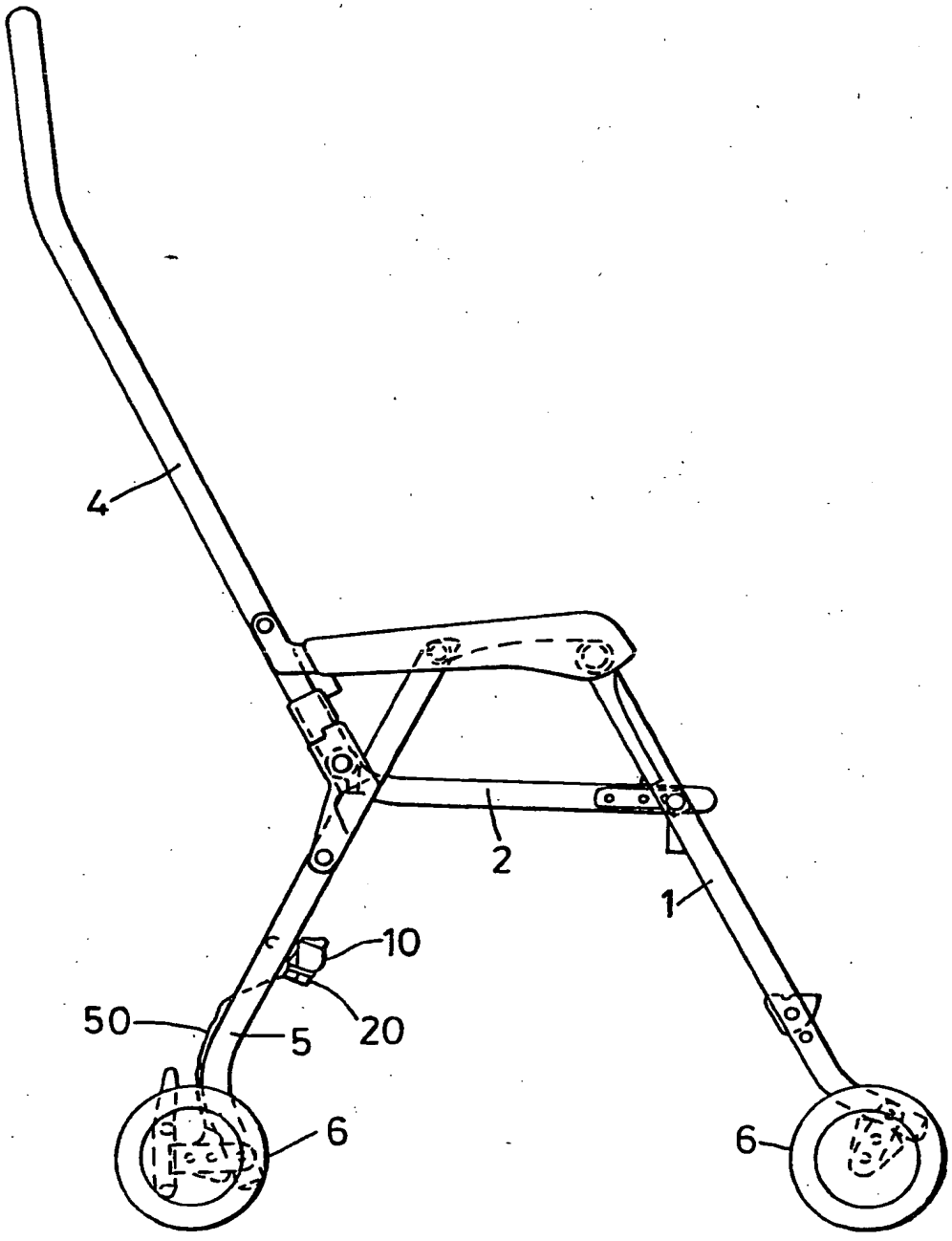

Fig. 1

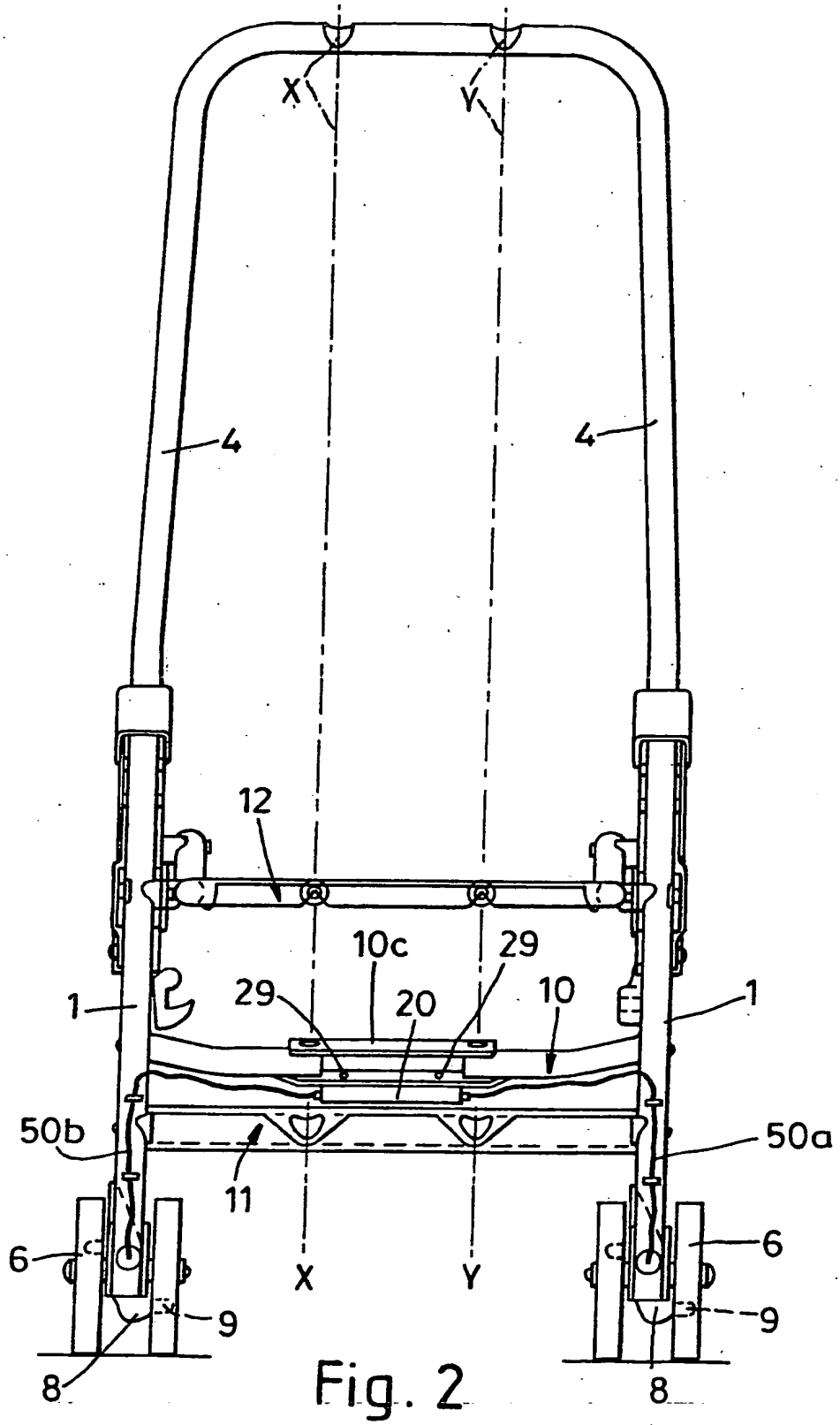

Fig. 2

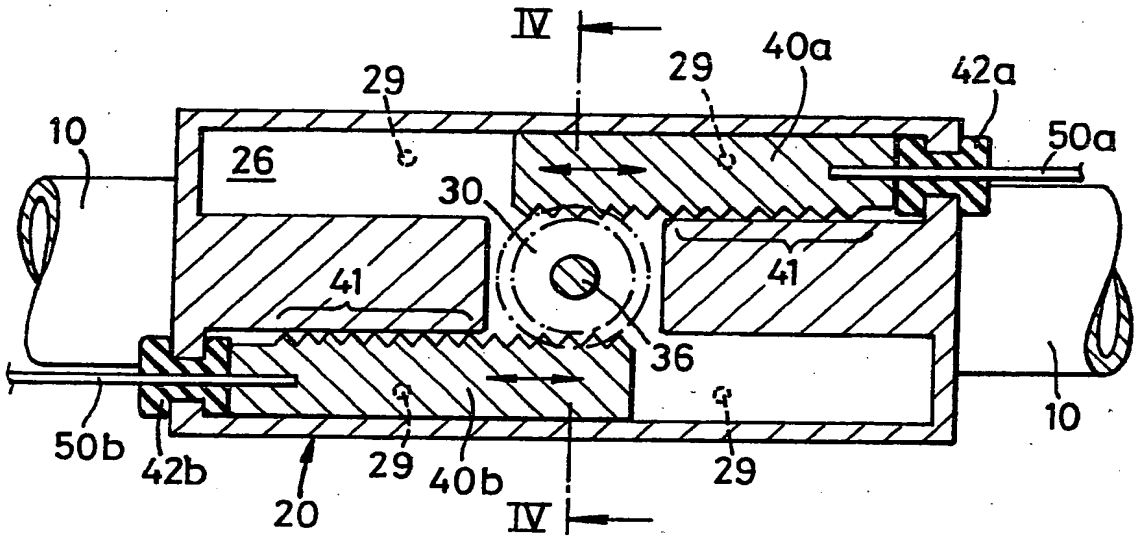
IV
29
29
40a
42a
10
26
30
50a
41
41
36
50b
42b
29
40b
29
10
20
IV

Fig. 3

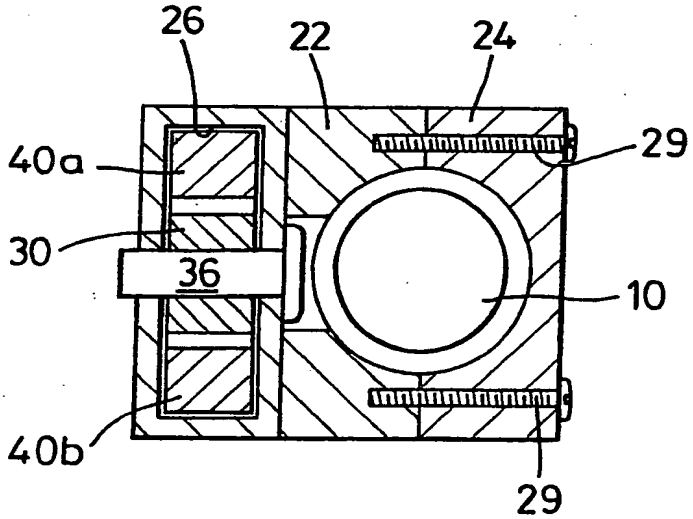
26
22
24
40a
29
30
36
10
40b
29

Fig. 4

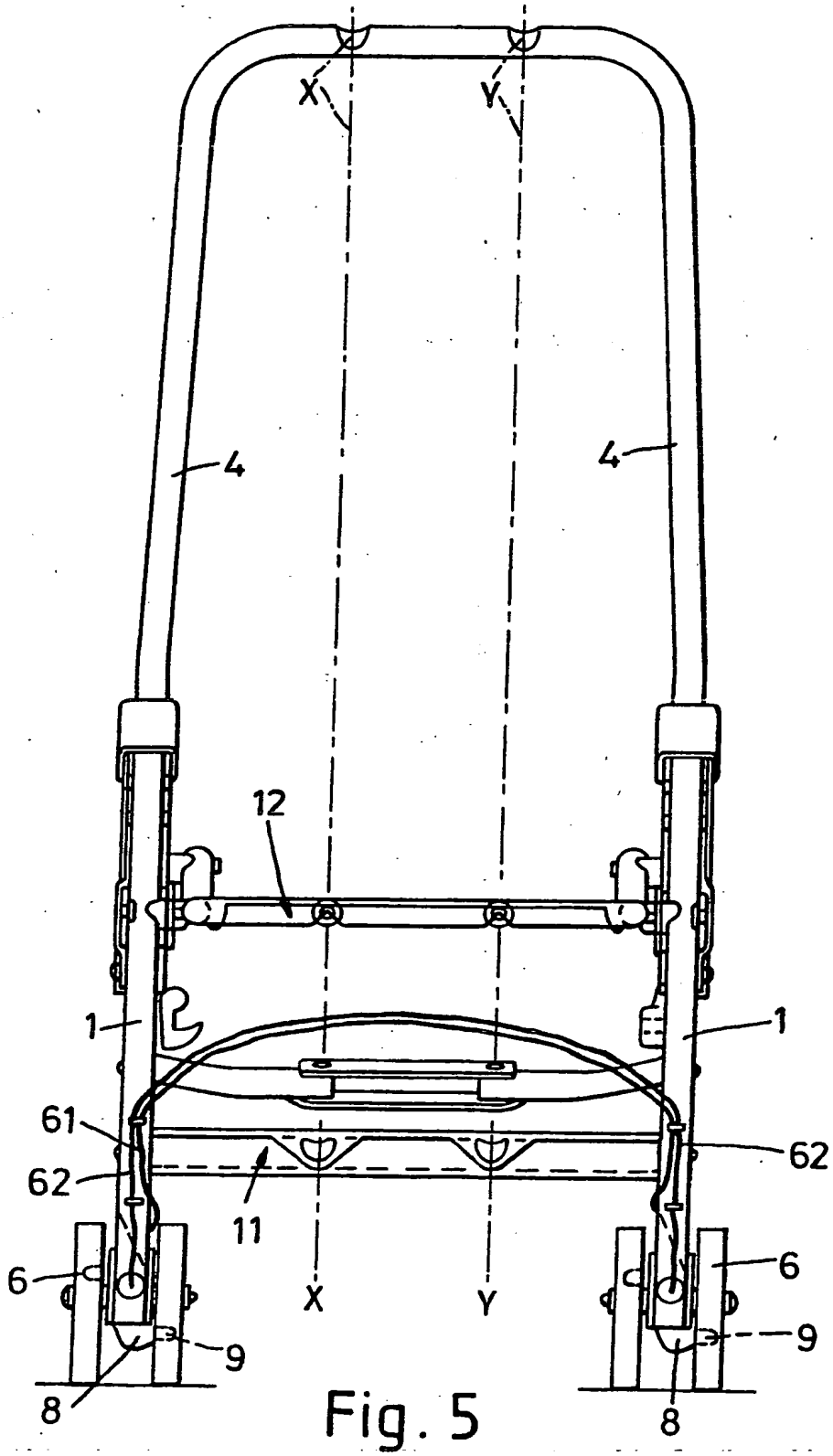

Fig. 5

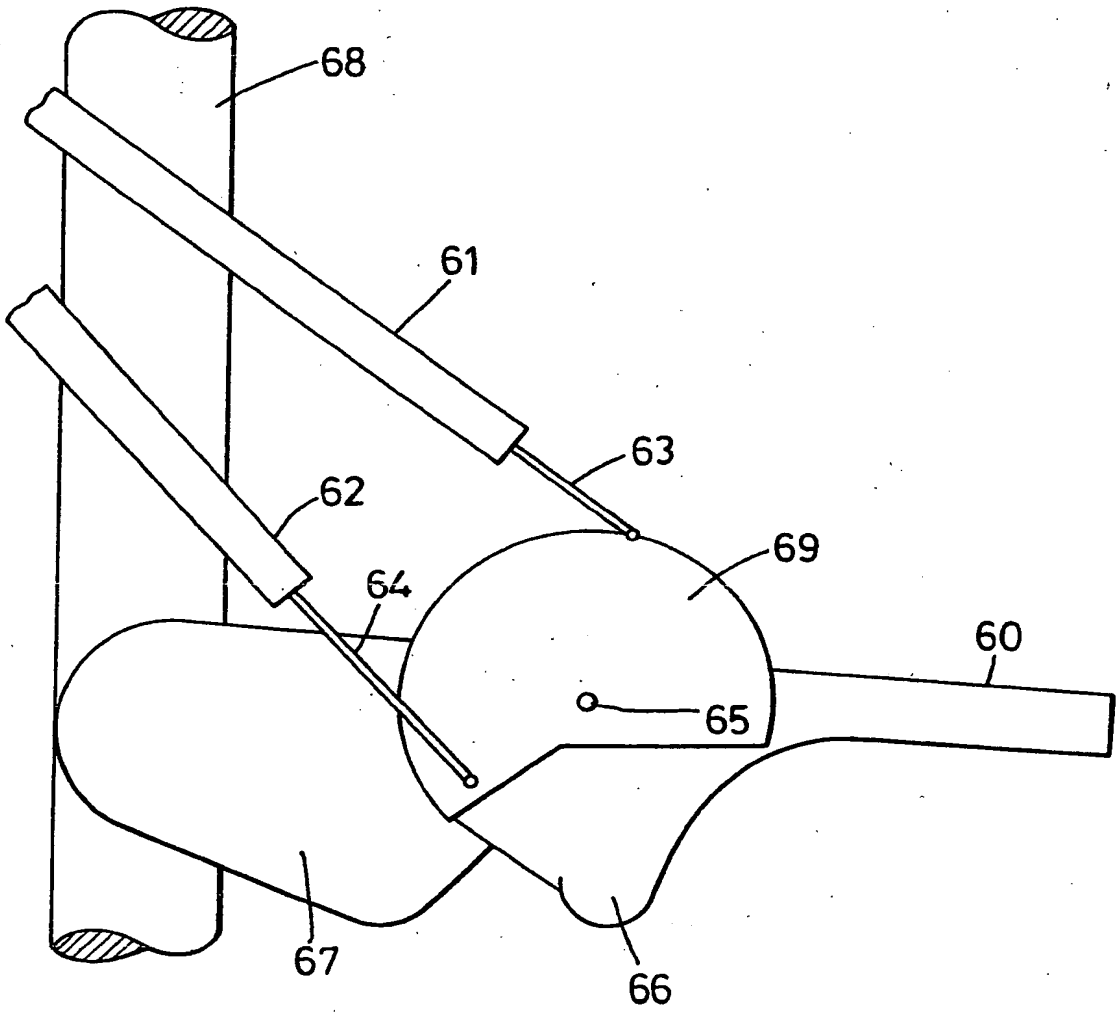

Fig. 6

FOLDING CHAIR BRAKE MECHANISM

This invention relates to folding chairs, especially folding pushchairs, and in particular to a brake mechanism for the wheels thereof.

Folding pushchairs, such as those for babies and young children, are well known in the art and examples of such folding pushchairs are disclosed in GB1469770 and our copending United Kingdom patent application No. 9205372.7. Essentially, these known types of folding pushchair comprise a framework of interconnected members which are appropriately hinged or otherwise connected together so that the frame is able to be folded down in a compact manner for storage or transport when not in use and also to be readily erected and locked in that erected position for when the chair is to be used for carrying a baby or child in a seat which is attached to the frame. As with most known pushchairs, forward and rear pairs of wheels are provided at the ends of respective leg members and for safety reasons there is generally provided a brake mechanism actuable upon at least one of the wheels, so as to lock the chair in a stationary condition as and when required, for example particularly when it is desired to park the chair on a sloping surface whilst a baby or child is being carried in it.

A problem with known brake mechanisms which prevent rotation of only one of the wheels of a pushchair is that if the chair is parked on a non-level surface, swivelling of the chair about that locked, stationary wheel can easily take place. This can itself pose serious dangers to a baby or child sitting in the chair, when for example the chair is parked near the edge of a pavement in close proximity to passing traffic or near some other ground formation which could result in the chair tipping over. This problem is exacerbated in the case of a pushchair which has swivelling wheels, and especially if that wheel upon which the brake acts is free to swivel relative to the frame.

With this danger in mind, it is desirable for pushchairs, particularly those with swivelling wheels, to incorporate wheel brake mechanisms which act on more than one of the wheels, in order to remove this instability due to swivelling. To satisfy this object, it is known to provide such pushchairs with multiple brakes which act independently on at least two of the wheels, e.g. both of the pair of rear wheels of the chair. However, such brakes require separate, independent actuation to fully lock the chair against swivelling, which therefore necessitates multiple braking operations by the user, which is tedious and runs the risk of not being effected properly.

In fact, the dangers posed by insufficient braking mechanisms for pushchairs, especially those with swivelling wheels, are considered so important by certain official bodies, that it is a requirement of the relevant British Standard that pushchairs with swivelling wheels include braking mechanisms which lock the swivelling wheels together simultaneously by actuation of a single brake mechanism.

In the context of fixed transportable structures such as conventional prams and various types of trolleys, there are known braking mechanisms which incorporate brakes which act upon a plurality of wheels, yet are actuatable simultaneously by the actuation of a brake lever or the like on just one of the wheels. The method of coupling the brakes together is for example by means of rigid rods anchored to appropriate members of the frame. Such known arrangements are however not applicable to folding structures such as the folding pushchairs referred to above, because by its very nature the foldable arrangement of frame members makes it impossible to link the braking means on the various wheels together so that they are actuatable simultaneously when the chair is unfolded, yet do not interfere with, and are not interfered by the folding mechanism of the chair itself.

There is therefore a need for a wheel brake mechanism which permits at least two wheels of a pushchair to be acted upon simultaneously by actuation of just a single brake means, but which is aimed specifically at a folding type of chair.

Accordingly, the present invention provides a wheel brake mechanism for a foldable chair having at least two wheels attached to respective frame members which are hingedly interconnected so as to be foldable relative to one another, the brake mechanism comprising: primary brake means engageable with a first wheel; at least one subsidiary brake means engageable with a respective at least one other wheel; and coupling means which operatively couple the primary brake means to the or each subsidiary brake means; wherein the coupling means are constructed and arranged such that the operative coupling is permanent and unaffected by the folded state of the chair. This latter requirement may be fulfilled in accordance with the invention by virtue of the coupling means being associated with, e.g. by acting through or by being mounted in or on, that part of the foldable frame between the wheels, e.g. the pair of rear wheels which may or may not be swivellable relative to the frame, carrying the primary and subsidiary brake means, and by being flexible so as to accommodate, without affecting the braking operation of the mechanism,

the relative hinging movement of the frame members during folding of the chair.

In accordance with the invention, it is of course possible for any two or more wheels of the chair to be coupled together in this manner, though in typical embodiments, it will generally be the pair of rear wheels which are linked in this way, because this provides maximum stability for the chair when the wheels are locked together and the chair is occupied by a baby or child. Preferably, a primary brake is actuable by the foot of the user, for example by pressing on a pedal-like extension of the primary brake, and this actuation of the primary brake causes corresponding actuation of a corresponding subsidiary brake by the coupling means so that both brakes are actuated simultaneously and both the rear wheels of the chair are locked against rotation. It is also generally preferable for the primary brake to be easily accessible to the user who will be pushing the chair from behind and will thus require easy access to the braking mechanism with his or her foot.

A preferred, though not essential, type of braking action is one in which both brakes act on their r spective wheels in the same direction. The opposite arrangement, in which the primary and the subsidiary brake means act on their respective wheels in opposite

directions, may frequently be undesirable, because it exaggerates any free rotational play of the wheels when in their locked condition by additive combination of the play in the individual wheels. This would therefore have the result of encouraging at least a small amount of swivelling motion of the pushchair when both primary and subsidiary brake means are actuated, which is generally a result which is to be avoided in preferred embodiments of the invention.

A first form of the coupling means of the brake mechanism of the invention employs a Bowden cable, one end of the Bowden cable being attached to and actuated upon by the primary brake carried on one of the rear wheels of the foldable chair and the other end of the Bowden cable being connected to the subsidiary brake carried on the other of the rear wheels of the chair.

For reasons of maximum stability, in order that the brake means acting upon each of the rear wheels of the chair can be of the same construction and can act upon the respective wheels from the same direction, the first form of the coupling means preferably further comprises a reversing mechanism which in the case of the preferred Bowden cable, or other similar cable-operated mechanism, causes a reversing of the direction of travel of the cable where it is attached to the primary and the

subsidiary brake means at each respective wheel. Thus, if actuation of the primary brake gives rise to a retraction of the cable, then the reversing mechanism enables a corresponding retractive action to occur at the subsidiary brake, so that it locks its respective wheel in exactly the same manner as does the primary brake.

A preferred reversing mechanism comprises a rack and pinion device which includes a first rack element coupled to a first section of the cable, and a second rack element coupled to a second section of the cable, the two rack elements engaging with opposite sides of a rotatable pinion, whereby a longitudinal displacement of the first rack element causes, through rotation of the engaged pinion, a corresponding reverse longitudinal displacement of the second rack element. In this manner, a pulling action on the first section of cable coupled to the primary brake causes a similar pulling action on the second section of cable coupled to the subsidiary brake, with the result that both brakes act on their respective wheels in the same direction.

A second, and preferred, form of the coupling means of the brake mechanism of the invention employs two Bowden cables in tandem, which permanently operatively link the primary and subsidiary brakes such that both will engage or disengage their respective wheels

simultaneously, regardless of which brake is actually operated by the user.

This form of coupling means may thus have the advantage that the pair of brakes can conveniently be engaged from either side of the chair.

Furthermore, the need for the reversing mechanism is removed in this form of the coupling means, since it is possible with the tandem Bowden cables to provide a symmetry between the sides of the pushchair by attaching the two Bowden cables to each brake at different locations on the respective brake, the first cable being attached to the first brake at a first location and to the second brake at a second location spaced from the first, and the second cable being attached to the first brake at a corresponding second location and to the second brake at a corresponding first location. In this arrangement, the first and second brakes are permanently operatively linked and move in like directions as either one of them is actuated.

The or each Bowden cable, for use in either the first or the second form of the coupling means in the invention may be of any conventional form and is preferably formed such that the core has a smooth surface and fits snugly into the circular bore of the cable

sheath. This assists in hindering the ingress of dirt, sand particles or other debris between the core and the sheath. In order to facilitate the formation of a smooth surface for the core, the core may, for example, be formed of nylon, or more preferably, of metal wire coated with a plastics material.

Embodiments of the wheel brake mechanism of the present invention will now be described in detail with reference to the accompanying drawings, in which:-

Figure 1 is side elevational view of a folding pushchair (with seat removed) including a first embodiment of the brake mechanism of the invention, the embodiment employing the first form of coupling means;

Figure 2 is a front elevational view of the pushchair of Figure 1;

Figure 3 is a part-sectional view of the reversing mechanism of the braking system of Figure 1;

Figure 4 is a cross-sectional view on arrows IV-IV of Figure 3;

Figure 5 is a front elevational view of a pushchair including a second alternative embodiment of the brake mechanism of the invention, this embodiment employing the preferred second form of coupling means; and

Figure 6 is an enlarged side view of the primary brake of the embodiment of Figure 5.

Referring firstly to Figure 1, the foldable pushchair as illustrated here is substantially as described and illustrated in our co-pending United Kingdom patent application No. 9205372.7. Essentially, the chair comprises a framework of hingedly interconnected members including front legs 1, rear legs 5, side members 2 and handle members 4, these members being assembled into a framework and being hingedly interconnected so as to define a foldable structure having two parallel hinged axes X and Y as shown in Figure 2. Further constructional details and operation of the folding mechanism is as described in our earlier UK patent application referred to above.

Each of the front and rear leg members 1 and 5, respectively, has mounted at its lower end a ground-contacting wheel 6 which is freely rotatable about a horizontal axle mounted at the lower end of each leg. Each wheel 6 incorporates a brake means which comprises a pivotable brake element 8 which at one end has a protruding foot 9 which, when the brake element 8 is pivoted in a braking direction, engages with one or more rotating parts of the wheel so as to resist or prevent the wheel rotating on its axle, thereby acting as a brake.

As seen in Figure 2, the brake carried by the

right hand wheel 6 constitutes a primary brake which may be the one which will normally be actuated by the person wishing to apply the brake to the chair, using for example his or her foot to pivot the primary braking element to its wheel-braking position as shown in the Figure. Preferably, there is provided a pedal-like extension to the primary braking element 8 (though not shown in Figure 2 for clarity), which makes it easier for one to actuate the primary braking means and make it more visible and accessible to the user, which may be desirable in circumstances of emergency braking.

The brake of the left hand wheel as seen in Figure 2 constitutes a subsidiary brake means and in practical terms is substantially identical in construction and operation to the primary brake means on the right hand wheel of the chair. The primary and secondary brakes are coupled together via a Bowden cable 50a, 50b, which (as is known in the art) is able to transmit a longitudinal displacement of the primary brake to a corresponding longitudinal movement of the subsidiary brake, although these longitudinal movements of the two brakes are oriented in different directions. By use of the Bowden cable, therefore, actuation of the primary brake on the right hand wheel as seen in Figure 2 actuates simultaneously the subsidiary brake on the left hand wheel.

In order that the primary and subsidiary braking elements 8 on the two wheels 6 act on their respective wheels in the same direction, the brake system further includes a reversing mechanism which is provided within a housing 20 which is preferably attached to one of the frame members of the chair, such as the central section 10C of a rear support bar 10. Anchoring of the reversing mechanism in this position allows optimum freedom of movement of the adjacent sections of the support bar 10 during folding up and folding down of the chair, without substantial interference with the Bowden cable 50a, 50b, which is anchored at appropriate points to the leg members 5 of the chair. The construction and operation of the reversing mechanism 20 will be appreciated more clearly by reference to Figures 3 and 4.

The housing 20 containing the components of the reversing mechanism is preferably securely mounted, e.g. by screws 29 with or without a suitable bracket, to the frame member 10. The housing 20 defines within it an elongate channel 26. Within the channel are slidably accommodated a first rack element 40a and a second rack element 40b, these two rack elements being slidable relative to each other in parallel, longitudinal directions. Each rack element 40a, 40b comprises teeth or t eth-like formations 41 which engage with a single pinion 36 which is rotatably mounted within the housing

20 so that a toothed portion 30 of the pinion 36 meshes with the teeth 41 of both the first and the second rack elements 40a,40b. Thus, longitudinal movement of the first rack element 40a is transformed into a parallel but reverse longitudinal movement of the second rack element 40b, through rotation of the pinion 36.

The amount of longitudinal movement of the two rack elements 40a,40b, is limited by the length of the channel 26 and/or by the length of the toothed portions 41 of the respective rack elements which mesh with the pinion teeth 30.

The first rack element 40a is attached to one end of a first section 50a of the Bowden cable, the other end of which is attached to the primary brake means, which passes through a grommet 42a which seals the aperture in the housing 20 through which the cable passes. A corresponding arrangement is provided for the attachment of the second section 50b of the Bowden cable (which is attached to the subsidiary braking means) to the second rack element 40b.

So, a push/pull action of the Bowden cable generated by the primary brake means results in a corresponding push/pull action on the secondary brake means, so that both brakes act on their respective wheels

in the same direction.

Turning now to Figures 5 and 6, here there is shown a more preferred alternative embodiment of the invention, in which the coupling means between the brakes is formed by a pair of Bowden cables attached to the brakes and operating in tandem.

As shown in Figure 5, the two Bowden cables 61,62 of this embodiment are secured near their ends to the frame proximate the respective wheels. Each Bowden cable is positioned so that the peak of the arc it forms tends to move upward as the Bowden cable flexes due to the folding of the pushchair along axes X and Y.

The brake shown in Figure 6 is located near one of the rear wheels of the pushchair. It is actuable by pressing downwards on pedal 60, which extends rearwardly of the chair from brake element 69 which is pivotally mounted via support member 67 on frame member 68. When the pedal 60 is pressed downward, the brake element 69 pivots about pivot mounting 65 and so brings a foot 66 into a position where it interrupts the rotation of the wheel (not shown). As the brake element 69 pivots in this way, the core 63 of the first Bowden cable 61 is tensioned, and the tension is transmitted to the other end of the first Bowden cable 61, where the core 63 is

connected to the secondary brake (which is of corresponding construction to the primary brake shown in Figure 6). Disengagement of the primary brake is achieved by raising the pedal 60 and thus pivoting the brake element 69 in the opposite direction from before. This action tensions the core 64 of the second Bowden cable 62, and as a result disengages the secondary brake, in a corresponding manner to the action which engages the brakes.

The cores 63,64 of the Bowden cables 61,62 are formed with a circular cross-section, and the sheath of each cable has a snug circular bore of the same radius, so that dirt, sand grains, etc. are hindered from entering the crack between the cores 63,64 and their respective sheath.

The above described embodiments of the braking mechanism of the invention have been described with reference to the folding pushchairs as disclosed in the earlier patent specifications mentioned hereinabove. However, it should be understood that the braking mechanism of the invention is applicable to other kinds of pushchair and is not limited in its application to one design in particular. The braking mechanism of the invention has special r levance to those pushchairs which have swivellable wheels, i.e. wheels whose rotational

axes themselves are rotatable about a perpendicular swivel axis. Pushchairs with such wheels characteristically require simultaneous braking mechanisms on a plurality of wheels in order to satisfy optimum safety requirements and it is particularly, though not exclusively, to such types of pushchair that the present invention is directed.

The above described preferred embodiments of the invention should not be construed as limiting the scope of the invention in any way; on the contrary, many modifications and variations from that specifically described and illustrated may be made within the scope of the invention.

For example, in the case of swivelling wheels, it may be necessary to adapt the direction from which the Bowden cables enter the wheel assembly for actuation of the respective braking means, as will be appreciated by the person skilled in the art.

The above preferred embodiments have also been described with particular application to the two rear wheels of a pushchair. The invention may of course be applied to other wheels of the chair, and even to all three or four wheels, though in such a case, corresponding second and third coupling means which

correspond to the coupling means described and illustrated hereinabove, will be necessary, as the skilled person will readily appreciate.

CLAIMS

1. A wheel brake mechanism for a foldable chair having at least two wheels attached to respective frame members which are hingedly interconnected so as to be foldable relative to one another, the brake mechanism comprising: primary brake means engageable with a first wheel; at least one subsidiary brake means engageable with a respective at least one other wheel; and coupling means which operatively couple the primary brake means to the or each subsidiary brake means; wherein the coupling means are constructed and arranged such that the operative coupling is permanent and unaffected by the folded state of the chair.

2. A wheel brake mechanism according to Claim 1 associated with part of the foldable frame arranged between those wheels which carry the primary and subsidiary brake means, the coupling means being constructed to be flexible to permit folding of the chair without affecting the braking operation of the mechanism.

3. A wheel brake mechanism according to Claim 1 or 2 wherein the chair includes front and rear pairs of wheels and the primary brake means are engageable with a first rear wheel and the subsidiary brake means are engageable

with a second rear wheel.

4. A wheel brake mechanism according to any one of the preceding claims wherein the primary brake means are arranged to be actuable by a foot of the user.

5. A wheel brake mechanism according to any one of the preceding claims wherein each brake means is adapted to act slectively as both a primary and a subsidiary brake means.

6. A wheel brake mechanism according to any one of the preceding claims wherein each respective brake means includes a pivotally movable brake element, each element being pivotally movable between a first inoperative position and a second operative position.

7. A wheel brake mechanism according to any one of the preceding claims wherein the primary and subsidiary brake means act upon respective wheels from the same direction.

8. A wheel brake mechanism according to any one of the preceding claims wherein the coupling means includes one or more Bowden cables, each cable being associated with a primary brake means for one wheel of the chair and with a subsidiary brake means for another wheel of the chair.

9. A wheel brake mechanism according to Claim 8 wherein the coupling means includes a Bowden cable and employs a reversing mechanism which causes a reverse in the direction of travel of the cable between the primary and subsidiary brake means.

10. A wheel brake mechanism according to Claim 9 wherein the reversing mechanism includes a rack and pinion device which comprises a first rack element associated with a first section of cable, a second rack element associated with a second section of cable and a rotatable pinion engageable with the rack elements such that axial displacement of the first rack element in one direction drives rotation of the pinion to actuate corresponding axial displacement of the second rack element in an opposite direction.

11. A wheel brake mechanism according to Claim 8 wherein the coupling means employs two or more Bowden cables in tandem which operatively link two or more brake means so that each respective brake means is selectively operable as both a primary and a subsidiary brake means.

12. A wheel brake mechanism substantially as hereinbefore described with reference to, and as illustrated in, any one of the accompanying Figures 1 to

13. A foldable chair provided with a wheel brake mechanism as claimed in any one of the preceding claims.

Examiner's report to the Comptroller under Section 17 (The Search report)

Relevant Technical Fields	Search Examiner
(i) UK Cl (Ed.M) F2E (ES)	PETER SQUIRE
(ii) Int Cl (Ed.5) B62B 5/04, 9/08	Date of completion of Search 20 SEPTEMBER 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES: WPI	Documents considered relevant following a search in respect of Claims :- 1-13

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2256685 A	(ALBION) see page 3 lines 28-36	1,3,4,5,6,7 13
X	GB 2168118 A	(APRICA KASSAI) see eg page 1 lines 80-92 and page 8 lines 68-117	1-4,6-8,13
X	GB 2142995 A	(KASSAI) see eg page 1 lines 44-53	1-4,6-8,13
X	GB 749119	(METAL PRODUCTS) see page 2 lines 53-60	1-3,6-8,13

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